

**DEPARTMENT OF TRANSPORTATION**

DIVISION OF ENGINEERING SERVICES

OFFICE ENGINEER

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*Flex your power!  
Be energy efficient!*

March 4, 2011

12-Ora-5721

12-0AA014

Project ID 0000001248

Addendum No. 2

Dear Contractor:

This addendum is being issued to the contract for CONSTRUCTION ON STATE HIGHWAY IN ORANGE COUNTY IN IRVINE AT THE TRANSPORTATION MANAGEMENT CENTER AT 6681 MARINE WAY.

Submit bids for this work with the understanding and full consideration of this addendum. The revisions declared in this addendum are an essential part of the contract.

This addendum is being issued to set a new bid opening date as shown herein, revise the Project Plans, and revise the Notice to Bidders and Special Provisions.

Bids for this work will be opened on Wednesday, March 23, 2011. The original bid opening date was previously postponed indefinitely under Addendum No. 1 dated December 1, 2010.

Project Plan Sheets 1, 2, 3, 4, 5, and 6 are revised. Copies of the revised sheets are attached for substitution for the like-numbered sheets.

In the Notice to Bidders the fourteenth paragraph is revised as follows:

"A mandatory prebid meeting is scheduled from 10:00 a.m. to 12:00 p.m., on March 15, at the Orange County Traffic Management Center at 6681 Marine Way, Irvine, California 92618. The purpose of the meeting is to allow the Bidders to view the site."

In the Special Provisions, Section 4, "BEGINNING OF WORK, TIME OF COMPLETION, AND LIQUIDATED DAMAGES," is revised as attached.

In the Special Provisions, Section 10-1.01, "ORDER OF WORK," the following paragraph is added after the second paragraph:

"Work requiring power to be disconnected at the facility shall be performed during the weekend and during non-critical hours as determined by the Engineer. The Contractor shall notify the Engineer 7 days prior to disconnecting power at the facility."

In the Special Provisions, Section 12-16.03, "PHOTOVOLTAIC SYSTEM," is revised as attached.

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12-Ora-5721  
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To Bid book holders:

Indicate receipt of this addendum by filling in the number of this addendum in the space provided on the signature page of the Bid book.

Submit bids in the Bid book you now possess. Holders who have already mailed their book will be contacted to arrange for the return of their book.

Inform subcontractors and suppliers as necessary.

This addendum and attachments are available for the Contractors' download on the Web site:

**[http://www.dot.ca.gov/hq/esc/oe/project\\_ads\\_addenda/12/12-0AA014](http://www.dot.ca.gov/hq/esc/oe/project_ads_addenda/12/12-0AA014)**

If you are not a Bid book holder, but request a book to bid on this project, you must comply with the requirements of this letter before submitting your bid.

Sincerely,



JAMES E. DAVIS  
District Director

Attachments

#### **SECTION 4. BEGINNING OF WORK, TIME OF COMPLETION, AND LIQUIDATED DAMAGES**

The 1st working day is the 80th day after contract approval.

Do not start work at the job site until the Engineer approves your submittal for:

1. Water Pollution Control Program (WPCP)

You may enter the job site only to measure controlling field dimensions and locating utilities. Do not start other work activities until all the submittals from the above list are approved and the following information is submitted:

1. Notice of Materials To Be Used.
2. Written statement from the vendor that the order for electrical material has been received and accepted by the vendor. The statement must show the dates that the materials will be shipped.

You may start work at the job site before the 80th day after contract approval if:

1. You obtain required approval for each submittal before the 80th day
2. The Engineer authorizes it in writing

The Department grants a time extension if a delay is beyond your control and prevents you from starting work at the job site on the 1st working day.

Complete the work within 35 working days.

## 12-16.03 PHOTOVOLTAIC SYSTEM

### PART 1 GENERAL

#### SUMMARY

Scope: This work shall consist of designing, furnishing and installing a fully operational photovoltaic (PV) system in accordance with the details shown on the plans and these special provisions.

The PV system shall be a utility interactive grid-tie PV electric generating system including a monitoring system that is installed, fully operational, and centrally monitored.

The Contractor shall be responsible for providing and installing the complete PV system including the following:

1. Self ballasted racking system for mounting PV array
2. Vandal resistant fastening
3. Support system for electrical conduits and components

Plans are diagrammatic and are intended to establish basic dimension of units.

The Contractor shall notify the Engineer when the PV system is delivered to the jobsite.

Related work:

Drilling and bonding dowels (chemical adhesive) shall conform to the provisions in "Drill and Bond Dowels (Chemical Adhesive)" in Section 12-3, "Concrete and Reinforcement" of these special provisions

#### UTILITY REBATE

A rebate application has been submitted to the electric utility company by the State of California Department of Transportation (Caltrans). Caltrans shall receive the rebate once the installation of the PV system is approved by the local electrical utility company.

The Contractor shall meet the following requirements of the rebate:

1. Installed system, including all components, must meet or exceed the local electrical utility company interconnection requirements for self-generating equipment. The local electrical utility companies for each structure are listed in the following table.

Structure	Local power company
TRANSPORTATION MANAGEMENT CENTER	SOUTHERN CALIFORNIA EDISON

2. Installed system components shall comply with the requirements of IEEE 1547-2003 Standard for Interconnecting Distributed Resources with Electric Power Systems.

After the installation work has been completed, the Contractor shall contact and arrange with the local electrical utility company representative to inspect and approve that the PV system complies with the rebate requirements.

The Contractor shall notify the Engineer at least 2 days prior to the inspection date.



## DEFINITIONS

Array: A mechanically-integrated assembly of modules, together with support structure and foundation, thermal control, and other components, if used, to form a DC power-producing unit.

CSI: Stands for California Solar Initiative.

CEC-AC rating: Rating as defined by the CSI.

Insolation: Sunlight, direct and/or diffuse. The integrated intensity of sunlight reaching a given area, usually expressed in watts per square meter per day. This measurement may be used to express the average amount of solar energy falling on different regions of the country.

PV Module: A number of solar cells connected together electrically and sealed inside a weatherproof package with a clear face.

NRTL: Stands for Nationally Recognized Testing Laboratory.

Photovoltaic (PV): Pertaining to the direct conversion of light into electricity.

PTC (PVUSA Test Conditions): Test conditions applied to PV modules intended to represent wattage during operation. Irradiance of 94.92 watts/ft<sup>2</sup>, 68 °F ambient temperature, 3.28-feet/second wind speed, and an air mass of 1.5.

String: A number of modules interconnected electrically in series to produce the operating voltage required by the load.

Standard Test Conditions (STC): Test conditions applied to PV modules. Irradiance of 92.94 watts/ft<sup>2</sup>, cell temperature of 77 °F ambient temperature, and an air mass of 1.5.

Utility-Interactive Inverter: An inverter that can function only when electrically connected to the utility grid, and uses the voltage and frequency on the utility line as a control parameter to ensure that the photovoltaic array's DC output is converted to AC power fully synchronized with the utility power.

## SYSTEM DESCRIPTION

### Performance Requirements:

The PV system shall be designed for life expectancy of 25 years. The PV system shall be sized to meet or exceed alternating current (AC) energy generation requirements as shown on the plans. Available roof areas for mounting PV modules are shown on the plans.

Alternating current kilowatts of energy generation shall take into consideration system losses, including but not limited to wire losses, fault protection losses, inverter efficiency, and PV system component degradation over life expectancy of system. PV module manufacturer shall warrant that selected PV modules shall produce no less than 80 percent of the maximum rated power during the first 20 years of their service.

## SUBMITTALS

### Pre-Construction Submittals:

Pre-Construction submittals for the PV system shall be submitted for approval prior to the start of construction. Pre-Construction submittals shall include the following:

1. PV module and conduit layout plan.
2. PV manufacturer qualifications
3. PV Installer qualifications
4. Monitoring system installer qualifications

5. Manufacturer's installation instructions
6. Bill of Materials (BOM) including manufacturer and part number.
7. Cut sheets of each item listed on the BOM and Test Certification data.
8. Working drawings and design calculations.
9. Product data.
10. A sample of the warranty that will be furnished for the completed monitoring system.
11. A cost proposal to the Department for maintaining the monitoring system after acceptance of contract. The proposal shall include maintenance and services that will be provided.

**PV Module and Conduit Layout Plan:**

PV module and conduit layout plan shall show 1) the layout of the self-ballasted racking system and PV modules on the roof, 2) the layout of conduits on the roof and the building interior and exterior, and 3) all areas of the roof or walls that will be disturbed during the installation of the PV modules.

**Working Drawings:**

Working drawings, PV mounting system structural calculations, and PV electrical system electrical calculations shall be submitted for approval.

Working drawings shall show fabrication, installation, and finish for the PV system and shall consist of the following:

1. Fully dimensioned plans and elevations showing all major components of the PV system.
2. Installation details of self-ballasting racking system, including mounting rack support.
3. Wiring diagrams including conductor identification (origin and destination) of all power and control conductors.
4. Rough-in requirements.
5. System grounding locations.

**Product Data:**

A list of materials and equipment to be installed and the manufacturer's descriptive data shall be submitted for approval prior to procurement. Any other data as requested by the Engineer shall also be submitted for approval.

Manufacturer's descriptive data shall include complete description, performance data, results of PV system performance estimate, and installation instructions for the materials and equipment specified herein.

Monitoring system equipment product data shall include layout, wiring diagrams, power supply, capacities, sizes, performances, sub-array monitoring, and communication equipment.

Manufacturer's descriptive data shall be submitted for the following:

- PV modules
- Utility interactive inverter cabinet
- Circuit combiner boxes
- DC/AC surge protection systems
- Factory finishes
- Hardware
- Sealants
- Grounding accessories
- Self ballasted racking system
- Utility AC disconnect switch
- Monitoring System
- Sub-array monitoring

#### Closeout Submittals:

Closeout documents shall contain the following sections:

1. Operating instructions for the complete PV system.
2. Maintenance instructions for the complete PV system.
3. Operational manuals for each system listed on the BOM.
4. Specified product warranty information.
5. As-built drawings.
6. At the conclusion of all PV installation work and testing, a certificate of compliance shall be submitted stating that the work has been performed in compliance with the CSI and these special provisions.

Three copies of each closeout document shall be submitted in the following manner:

1. CD with PDF files
2. Individual 3-ring binder containing paper copies.

Inadequate or incomplete material shall be returned. The Contractor shall resubmit adequate and complete manuals at no expense to the State.

#### QUALITY ASSURANCE

##### Regulatory Requirements:

The PV system shall meet the requirements of the (CSI Handbook). Copies of the handbook can be found at the following website:

[http://www.gosolarcalifornia.ca.gov/documents/CSI\\_HANDBOOK.PDF](http://www.gosolarcalifornia.ca.gov/documents/CSI_HANDBOOK.PDF)

If there is a conflict or overlap of requirements between the CSI Handbook, project plans, or these specifications, the most stringent requirements shall be applied.

##### PV Installer Qualifications:

The PV installer shall be a registered installer listed on the CSI database found at the following website:

<http://www.gosolarcalifornia.ca.gov/retailers/search-new.php>

The PV installer shall have experience in designing and installing at least one commercial PV system of 30 kW or greater.

##### Monitoring System Installer Qualifications:

The monitoring system installer shall be either the monitoring equipment manufacturer or an authorized representative of the manufacturer, who is approved by manufacturer to install monitoring systems similar to those specified herein.

The installer shall have experience successfully installing a minimum of 2 monitoring systems similar to those specified herein.

The manufacturer providing components for the PV system shall have a minimum of 5 years successful experience, manufacturing and providing components for PV systems similar to those specified herein.

All components for the monitoring system shall be provided by a single manufacturer.



If the monitoring system is not installed directly by the manufacturer, a representative of the manufacturer shall be present during installation and testing of the system.

The manufacturer's limited warranty for the monitoring system shall be a minimum of 5 years.

The manufacturer's limited warranty for the PV module shall be a minimum of 25 years.

## **PART 2 - PRODUCTS**

All PV system components shall be factory assembled and tested.

PV system components shall be sized to the system capacity and voltage requirements as shown on the plans, and be designed to provide maximum power point tracking for voltage and current range expected from the PV array for temperatures and solar insolation conditions expected for project site conditions.

PV Modules: PV modules shall conform to the requirements shown on the plans.

Utility Interactive Inverter Cabinet: Utility interactive inverter cabinet shall conform to the requirements shown on the plans.

Circuit Combiner Box: Circuit combiner box shall conform to the requirements shown on the plans.

Self-Ballasted Racking System:

Self-ballasted racking system shall meet seismic and wind code requirements of the CBC 2007

Self-ballasted racking system shall be Unirac, DPW Solar or approved equal.

Utility AC disconnect switch: Utility AC disconnect switch shall conform to the requirements shown on the plans.

Monitoring System:

Monitoring system equipment shall conform to the requirements of the PBI rebate section in the CSI Handbook, the plans and these special provisions, and shall have the following capabilities:

1. Measure total PV system efficiency
2. Download data over a user defined time period in a standard data format that can be imported into excel spreadsheets and other computer programs.
3. Monitor system performance by optionally breaking out the renewable energy source to DC efficiency and the DC to AC efficiency. DC measurements shall include sub-array currents, voltage, and total system current. AC measurements shall include 1-phase, and 3-phase voltages, currents, total harmonic distortion and power factor.
4. Track utility interactive inverter status and fault codes and log internal inverter measurements.
5. Monitor the alarm status of the system.

The monitoring system shall be centrally monitored by a Performance Monitoring and Reporting Service (PMRS), as required for Performance Based Incentive (PBI) rebates, for 5 years after acceptance of the contract.

Communication Device:

Communication device shall be capable of taking all field gathered data and outputting the data onto an ethernet connection.

Communication device may be located inside the utility interactive inverter cabinet, or in a separate outside cabinet. The separate cabinet shall be a NEMA 1 enclosure, with an exterior door that is lockable with a padlock.



#### Communication Cables:

Communication cables shall consist of RS485 cable and Cat 6 cables.

##### RS485 Cable:

RS485 cable shall be a shielded, one twisted pair with ground conductor, low loss, plenum rated, extended frequency data cable.

RS485 cable shall conform to TIA/EIA 485 Standard.

##### Cat 6 Cables:

Cat 6 cables shall be category 6 rated 500MHZ, 4 pair, 24 AWG, unshielded twisted pair (UTP), low loss, CMP Rated (plenum rated), extended frequency data cable.

Cat 6 cables shall conform to TIA/EIA-568-C.

Cat 6 cables shall have male RJ-45 connectors at each end.

#### Metering System:

Metering system may be located inside the utility interactive inverter cabinet, or in a separate outside cabinet. The separate cabinet shall be a NEMA 1 enclosure, with an exterior door that is lockable with a padlock.

Voltage pick up points, current loops and any other devices required for getting the power data, shall be furnished and installed as required to have a complete and operational monitoring system.

#### Control Interface:

Control interface may be located inside the utility interactive inverter cabinet, or in a separate outside cabinet. The separate cabinet shall be a NEMA 1 enclosure, with an exterior door that is lockable with a padlock.

Interface shall have isolated DC voltage and current sensors for gathering inverter and sub-array combiner data. The interface shall be able to monitor inverter status and fault codes.

Interface shall have a keypad, LCD display and be able to display PV system information.

#### PMRS Central Monitoring Access:

The Department shall be allowed access to all data, graphs, and other information recorded or tracked by the PMRS company.

Access shall be provided via a password protected system.

The password protected system shall allow simultaneous access by 2 Department personnel.

Accessories: All accessories necessary for the complete installation of the PV system components, shall be furnished and installed as required to have a complete and operational PV system.

## **PART 3 - EXECUTION**

### **EXAMINATION**

The Contractor shall verify that items provided under other portions of these special provisions are properly sized and located. Examine supporting members to ensure surfaces are at proper elevation and PV modules are free from dirt or other deleterious matter.

### **INSTALLATION**

#### **Self-Ballasted Racking System:**

Install PV modules array on existing roofs as shown on plans, in accordance with the provisions of the approved working drawings, and as described herein.

1. Self ballasted racking system shall be designed to withstand loading as shown on the plans and in conformance with the 2007 California Building Code.
2. Self ballasting racking systems shall be designed to accept framed PV modules.
3. Metal framed PV modules shall be grounded as shown on the plans and in conformance with the 2007 California Electrical Code, Article 690.

The Contractor shall notify the Engineer at least 2 days prior to installing the PV modules.

**Utility Interactive Inverter Cabinet Mounting:** Utility interactive inverter cabinet shall be installed on the existing concrete slab as shown on the plans.

#### **Monitoring System Equipment:**

Monitoring system equipment shall be installed as shown on the plans and according to the manufacturer recommendations.

Monitoring system equipment installation shall be coordinated with the installation of the PV system equipment.

### **TESTING AND APPROVALS**

**State Fire Marshal Approval:** The complete PV system shall be reviewed, approved, and accepted by the State Fire Marshal, after installation of the system has been completed.

#### **Functional Testing:**

After installation is completed, functional testing shall be performed in the presence of the Engineer to demonstrate that the entire PV system is functioning properly.

Functional testing of the PV system shall not be performed until:

1. All of the Engineer's punch list items have been corrected
2. The local electrical utility company representative has approved the completed PV system
3. Obtaining State Fire Marshal approval

The functional test shall consist of operating the entire PV system for 5 consecutive days. In the event any of the system fails to perform satisfactorily, the entire test shall be repeated after the deficiency has been corrected.

Functional testing shall also include testing of the monitoring system, including all local and remote monitoring features. The Contractor shall provide a laptop computer to demonstrate the remote monitoring features. The laptop shall have a wireless capability to connect to the internet.

Functional testing shall be performed in accordance with Section 86-2.14B, "Field Testing" and Section 86.2.14C, "Functional Testing," of the Standard Specifications.

The Contractor shall be responsible for the compatibility and adjustment of all operating functions of the PV system, in accordance with manufacturer's instructions and these special provisions.

The Contractor shall make necessary repairs, replacements, adjustments and retests at the Contractor's expense.

#### **CLEANING**

The Contractor shall clean surfaces in compliance with manufacturer's recommendations; remove excess mastic, mastic smears, foreign materials, and other unsightly marks

The Contractor shall clean metal surfaces exercising care to avoid damage.

The Contractor shall clean energy generating surfaces of the PV modules to ensure no obstructions block sunlight.